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*Byline*

# Miracles born of curiosity— payoff of 'useless' research

NEW YORK (AP)—One can imagine Oswald Avery then, in the early 1940s, all 100 pounds of him, a wisp of a man in a long tan coat, checking his test tubes and Petri dishes in his laboratory at New York's Rockefeller Institute.

Alone, but a soldier in a large, largely anonymous army, gently whistling to himself, a man in relentless pursuit except during his summer on Deer Island or on his sailboat in Maine's Penobscot Bay.

He was one of the people in basic research, the day-to-day work of science, building on similar labors of the past and contributing to similar labors in the future.

BUT THAT AUTUMN DAY, dwelling in what he called "the inwardness of research," Avery and his associates were pulling together threads spun since the 19th century. They were working with the agent that causes lobar pneumonia, the pneumococcus, but they weren't looking for a cure.

What they found was something called deoxyribonucleic acid, or DNA, something from the heart of the cell, something responsible for passing on genetic information from one pneumococcus to the other.

It was a discovery, then astounding, that in the decades ahead would lead other scientists to unravel the mysteries of genetics and so generate a revolution in biology.

You can date the DNA work to the 1850s, when a German chemist developed the concept of large molecules that was first applied to carbohydrates and proteins and finally to DNA.

Step by step, knowledge accumulated, leading to Avery's contribution, then to the discovery of DNA's structure by James Watson and Francis Crick in 1953, and on to today's gene-splicing and vistas of genetic engineering.

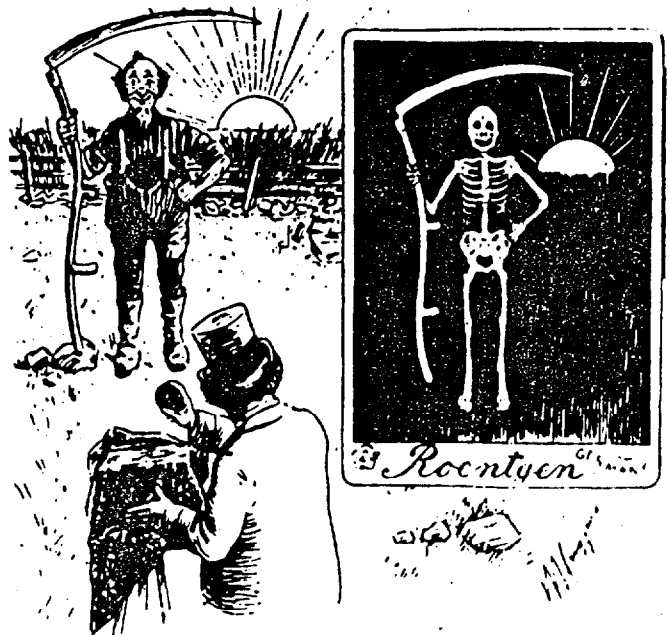
BUT AT MOST PHASES IN this long process, the research would have seemed to laymen as without the slightest practical value, a mere quest to satisfy scientific curiosity.

Scientists sometimes fret over this lack of understanding of fundamental research, particularly around budget time when public support of the enterprise is expressed in dollars.

Says Watson, who won the Nobel Prize in 1962, and who now heads the Cold Spring Harbor Laboratory on Long Island: "You never know which facts will be useful to you. You open a lot of frontiers you don't even know exist until you try."

"Useful as these efforts might be, it would be disastrous if we guided our efforts in basic science by considerations of their usefulness," says Efraim Racker, professor of biochemistry at Cornell University. It would have been easy, for example, to laugh at Gregor Mendel, endlessly experimenting with the cross-breeding of garden peas in the 1800s, or at Thomas Morgan, a 1933 Nobelist, who just as endlessly studied the fruit fly. "Yet these two men built the foundation of modern genetics," Racker notes.

INDEED, THE BASIC SCIENCE underlying many of recent medical achievements began in the 1890s, says Dr. Lewis Thomas, chancellor of the Sloan-Kettering Cancer Center.



ROENTGEN'S DISCOVERY of a beam of light that could pass through objects was cartooned in Life magazine in February, 1896. The caption read: "Look pleasant, please." (AP)

These efforts led to the understanding of bacteria and viruses and ultimately led to the cures of many infectious diseases. "It was the outcome of many years of hard work, done by imaginative and skilled scientists, none of whom had the faintest idea that penicillin and streptomycin lay somewhere in the decades ahead," Thomas writes in his book, *The Medusa and the Snail*.

"It was basic science of a very high order, storing up a great mass of interesting knowledge for its own sake, creating, so to speak, a bank of information, ready for drawing on when the time for intelligent use arrived.

"This, I think, is the established record of science itself, over the past 200 years, and we ought to have more confidence in the process."

Time and again that process has served up chance discoveries of immense significance:

- Wilhelm Roentgen was interested to see what happens when electron beams hit matter in vacuum tubes. He hit upon X-rays when he noticed that an object near one of them became fluorescent although black paper separated them from the tube.

- Sir Alexander Fleming discovered penicillin when he noticed colonies of bacteria around a mold that had grown on a dish where the culture was kept.